

**Regional Environmental Assessments (REA) and
Private Investment:
*The Fianarantsoa Côte Est (FCE) Railroad in
Madagascar***

Prepared by:

Karen Freudenberger, Josiane Rarivoarivelomanana, Railovy,
Anita Deeg, Philip J. DeCosse, and Noro Aina Andriamihaja

Projet d'Appui à la Gestion de l'Environnement
International Resources Group, Ltd.
1211 Connecticut Avenue, NW, Suite 700
Washington, DC 20036 USA

Prepared for:

USAID/Madagascar

October 2000

Environment Policy and Institutional Strengthening Indefinite Quantity Contact (EPIQ)

Partners: International Resources Group and Winrock International

Subcontractors: PADCO, Management Systems International, and Development Alternatives, Inc.

Collaborating Institutions: Center for Naval Analysis Corporation, Conservation International, KNB Engineering and Applied Sciences, Inc., Keller-Bliesner Engineering, Resource Management International, Inc., Tellus Institute, Urban Institute, and World Resources Institute

Abstract

The Government of Madagascar has begun an aggressive process of privatizing select government assets, among them the Fianarantsoa Côte Est (FCE) Railroad. The FCE Railroad runs from Fianarantsoa in the highlands through the biologically diverse tropical forests of the eastern mountain range of Madagascar and then down to the port of Manakara on the east coast. Studies completed to date on the internal financial viability of the railroad suggest that – under current terms of privatization – it is only marginally profitable. Consideration of the broader regional impacts of the train system, however, have led some planners to suspect that there are compelling environmental and economic arguments for saving this currently decrepit rail line.

To shed light on these questions, a regional environmental assessment was carried out. The assessment identified the major likely environmental and social impacts under two general scenarios: (1) the railroad is privatized and service is expanded and (2) the railroad continues to decline in regularity of service, eventually closing. Intensive socio-economic assessments were carried out using Rapid Rural Appraisal (RRA) techniques, while regional economic, environmental and social data was combined in an environmental economic cost-benefit modeling exercise.

The study focuses on the relation between the internal financial assessments —which focused on private return to investment in the railroad – and the regional environmental assessment, which analyses broader public benefits to maintenance of the rail system. Special emphasis is placed on the environmental impacts of the rail line and the consequences of its potential closing on the loss of tropical forest cover.

Regional Environmental Assessments (REA) and Private Investment: *The Fianarantsoa Côte Est (FCE) Railroad in Madagascar*

By

Karen Freudenberger, Josiane Rarivoarivelomanana, Railovy, Anita Deeg,
Philip J. DeCosse and Noro Aina Andriamihaja¹

Background

For the Fianarantsoa Region of Madagascar, as well as the nation as a whole, the Fianarantsoa – East Coast (FCE) Railway is a strategic infrastructure. Without the FCE and the port facilities in the coastal town of Manakara, Fianarantsoa would be the only regional capital in Madagascar without easy access to the sea. This would put the entire region at a distinct disadvantage with regard to the increasingly global economy.

Since 1996, USAID/Madagascar has been working with the railway to restructure its management in order to ensure its long-term economic viability and hence continued operation. USAID's involvement has been based on promoting a privatized management structure for the railroad. There has been relatively widespread support for



Figure 1: FCE Railroad Departing Fianarantsoa

¹ Karen Freudenberger (freudenberger@compro.mg) participated as a Consultant to the Projet d'Appui à la Gestion de l'Environnement (PAGE) (www.irqltd.mg), a project implemented by International Resources Group, Ltd (www.irqltd.com) and financed by USAID/Madagascar. Josiane Rarivoarivelomanana (josiane@irqltd.mg), Noro Aina Andriamihaja and Philip DeCosse (pdecosse@irqltd.mg) are employees of PAGE and IRG. Railovy (railovy@ensae.fr) was an employee until August, 2000, and is now pursuing studies in economics at ENSAE in France. Anita Deeg (anita@compro.mg) is a Peace Corps Volunteer working in Madagascar. The PRA conducted as part of the qualitative study included the following additional team members: Jean Claude Ratsimbazafy, Jerfin Bedel Vahoho, Maminirina Rakotozafy, Marolahy Adera Ambinina, Nirinantenaina Lala Randrianasolo and Nivohelisoa Rasoarilala.

this process by principal regional stakeholders, based on the perceived importance of a functioning rail system in the overall regional development and environmental dynamic but until recently there has been little hard evidence justifying significant public investment in the rail system.

This paper looks at how a recent Regional Environmental Assessment (REA) is informing the privatisation process and the way in which information from this study is shifting the public debate from narrowly based financial concerns to an analysis of the broader regional impact of the railroad. The proposal currently under discussion for the privatization of the FCE calls for a concessionary approach. In this scenario, a public holding company would be created and have responsibility for questions of eminent domain (thus retaining Malagasy public ownership of the track system) while a private management company would take responsibility for all operational aspects of the rail transport system. Under this scenario, effective privatization will require (1) substantial public investment in the rehabilitation and maintenance of the track system which is in a state of considerable decay and (2) convincing arguments to persuade potential private investors that the FCE can indeed be operated on a profitable basis.

The results of two recent studies commissioned by the Landscape Development Intervention (LDI), a USAID funded regional conversation and development program, illuminate these issues and make a strong case for both the public and private investments necessary for successful privatization. The first of these studies, conducted by the USAID-funded Environmental Management Support Project (PAGE) undertook a REA that combined a quantitative cost-benefit assessment with qualitative Rapid Rural Appraisals. Two scenarios were compared in this first study: (1) that the railroad is privatized and receives investment and (2) that the railroad does not receive any new investment and soon discontinues service. This study found that benefits derived from economic, social, and environmental impacts result in an Internal Rate of Return (IRR) of 16.6% for the region as a whole if the line improves its service. This conclusion argues for a public commitment of resources to the rehabilitation of the rail system as a prerequisite for privatization.

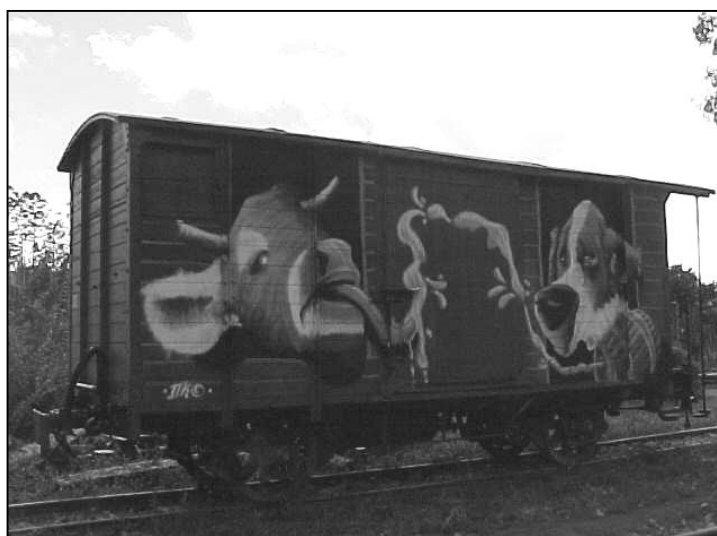


Figure 2: Gifts of used rails, wagons, and other equipment from the private Swiss railway companies have been instrumental in helping the FCE prepare for its own privatization.

The second study was an internal financial analysis conducted by the Fivoarana Consulting Firm. This study concluded that, under appropriate conditions, investments in the rail system by a private operator could generate positive returns, but that such private investments would need to be accompanied by complementary public investments in infrastructure which are likely to cost about \$11 million. This study confirms the potential financial viability of the rail line under private ownership.

These studies draw attention to the value of the REA for placing sometimes marginally profitable investments (when viewed from a strictly internal financial perspective) in a broader environmental and economic context in which they may have significant positive public benefits.

In the next section, we briefly describe the regional transport context and the study zone, and then turn to a summary of the findings from the REA. After turning next to a brief review of the findings of the internal financial report, we discuss the usefulness of the REA process for informing and influencing the private sector investment process.

The Regional Transport Context

The Fianarantsoa regional transportation network is made up of a variety of different modes – roads, rail, canal and maritime port. The FCE rail line crosses through a mountainous and otherwise largely inaccessible region. For 73 kilometers of its distance, it roughly parallels the RN 25 and the RN 12, which also link Fianarantsoa to the coast. However, on the other 90 kms of its journey, the tracks take an entirely different route. The train passes through some of the most productive areas of the region, collecting agricultural products for transport to either Fianarantsoa (on the westward route) or Manakara (on the eastward journey). The map in Figure 3 shows the path taken by major roads as well as the FCE railroad.

As shown on the map, the major alternative for transport from Fianarantsoa to Manakara (the RN 25 and RN 12) passes through the Ranomafana National Park and then through Ifanadiana, before heading down to Manakara. The other major road artery of the region is the RIP 4 that links the RN 25 with the train station of Manakara and continues down to the Tanala capital of Ikongo. Both the RN 25 and the RIP 4 suffer from serious maintenance problems at this time. Designed as a feeder road to the rail network, the RIP 4 was never intended to carry heavy tonnage. It can currently carry a maximum load of 5 tons per truck. It is closed to traffic for much of the rainy season and requires 4-wheel drive for a large part of the year. It would require a significant investment of funds to bring this road to the point where it could safely and sustainably carry the loads currently transported by the train.

In 1994, before large scale truck transport of fuel began and the RN 25 fell into even worse repair, the cost to rehabilitate the 240 kilometers of road from Fianarantsoa to Manakara was estimated at US\$40 million (276 Billion FMG, Louis Berger International). Replacing train service would require not only this major investment in the RN 25, but also rehabilitation of the RIP 4 and the construction of additional feeder roads from the area now served by the railroad to the RN 25.

The combination of longer distances to link key hubs by road and the poor quality of the road beds that imply higher costs to amortize vehicle repairs means that transport by the road is currently considerably more expensive than transport by train, as shown by the preceding table.

Comparison of Road and Rail Transport Costs from Manampatrana			
	Road Transport Cost	Rail Transport Cost	Rail transport costs as a percent of end Commodity price
Fuel	162 FMG/l.	90 FMG/l.	3%
Coffee	275 FMG/Kg.	95 FMG/Kg.	2%
Banana	250 FMG/Kg.	85 FMG/Kg.	9%

Economists often suggest that rail transport is no longer viable because it cannot compete with more flexible road transport. This is not the case with the FCE,

which demonstrates a large degree of complementarity with other transport modes in the region by carrying large loads of bulky produce in an area that is poorly (or not at all) served by roads. Furthermore, the geography of the zone conspires against the easy construction of new transportation arteries.

Without the FCE, people would be forced to ship by higher cost, lower volume road alternatives. Indeed, as described in greater detail below, most coffee planters in the Manampatrana – Ikongo area say that they would simply cut down the rest their coffee trees and convert production to rice and manioc in an effort to meet their subsistence needs. This would have repercussions throughout the regional economy and transport system. The coffee conveyed to Manakara by the FCE represents, for example, a significant proportion of the total coffee exports from this port city. Loss of coffee production from this zone would result in a 20–30% decrease in the volume of coffee shipped from the Manakara port in any given year.

The comparative advantages of transport by road and rail can also be seen in the transport of fuel. Fianarantsoa's fuel supply comes in through the port of Manakara and is then transported by truck or train from the coast to the highland city. Truck transport is both more expensive (see table preceding page), and causes significantly more wear and tear on public infrastructures. The train can haul 100 tons of fuel in one trip. In theory, it requires five fully loaded semi-trailer fuel trucks to transport as much. In reality, given the degraded condition of the road and the steep grades involved in climbing the mountain range, large tankers cannot make the trip fully loaded, therefore requiring even more trips.

Fuel consumption in Fianarantsoa grew from 34,000 m³ in 1995 to 39,000 m³ in 1999, a rate of increase 3.3% per year. It is unlikely that without enormous public investments (on the order, as noted above, of \$40m (276 billion Fmg) in road improvements to the RN 25 between Fianarantsoa and Manakara -- and continued investments over time to maintain the road -- truck transport alone will be able to satisfy the growing fuel needs of Fianarantsoa and the central highlands.

Finally, unlike many other railroads, passenger service remains a viable activity for the FCE. The isolated nature of much of the area it serves means that the train is the only reliable form of transportation for people living there. In the last few years, passenger use has remained relatively steady in spite of declining service due to the deterioration of equipment.

The Region Served by the FCE

The FCE railroad serves an area with a total population of around 800,000 people. It represents the only viable transportation for an isolated area where approximately 100,000 people occupy the steep slopes of the Tanala Piedmont. This area is directly adjacent to the ecologically sensitive forest corridor that links the Ranomafana and Andringitra National Parks. The forest has now been reduced by the expansion of agriculture to a narrow corridor, less than 7–10 kilometers wide in the areas immediately to the north and south of the FCE. The remaining forest is important not only for the critical role it plays in maintaining the world renowned biodiversity of this zone but also because it is believed to play an essential part in the hydrological balance of the entire region.

The FCE bisects a region that produces significant quantities of coffee (about 3000T of coffee is transported by the FCE per year), bananas (about 6000 tons exported by train per year), and other fruit (e.g. litchis, oranges, avocados). In general, coffee is collected from a radius of about 25 kilometers from the train line (especially to the south since there is no alternative road service), as shown in the map.

Transport of bananas, mainly from Tolongoina toward Fianarantsoa, has steadily increased in volume and now significantly exceeds the transport of coffee by weight. This is in part because there is virtually no transport of bananas by road. The bulkiness and low cost of bananas preclude their transport by the more expensive road traffic. Bananas are collected from a radius of approximately 10 kilometers because transport from the field of production to the railhead is by human power. In the absence of the train, the thriving banana economy would go defunct since it is not economically

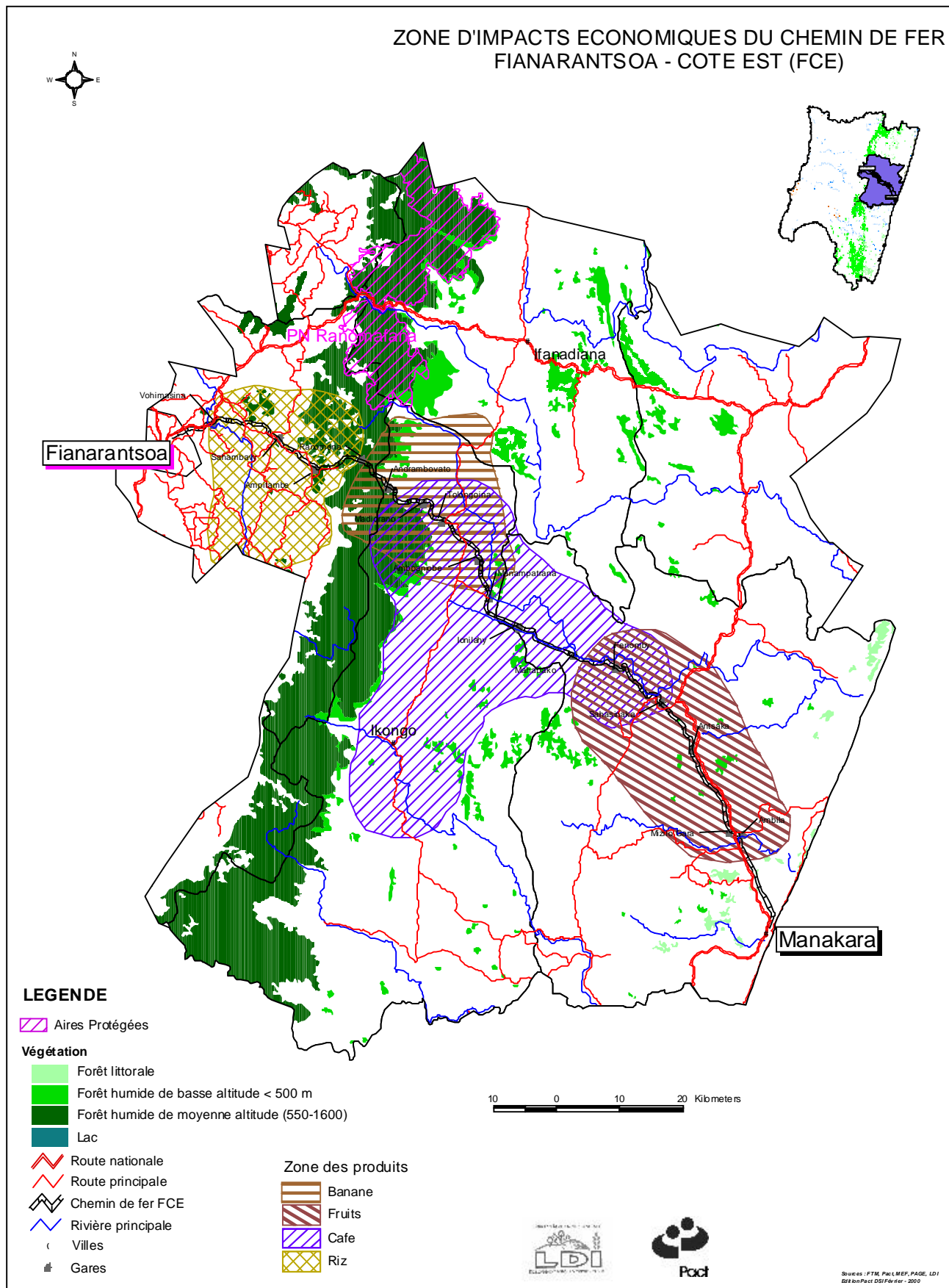


Figure 3: Economic Impact Zone of the FCE Railroad

profitable to carry bananas further than 10 kilometers to where they can be transported out of the region.

Summary of Findings from the REA

The cost-benefit study completed as part of the REA identified four major impact areas for modeling: agriculture, environment (particularly loss of forest cover and reduction in soil fertility), transport and social. Long-term costs and benefits of each of these modules were estimated over a 20 year horizon for each of the two scenarios: (1) disappearance of the railroad for lack of investment and (2) investment in the railroad via a form of privatization.

The cost-benefit model generated an Internal Rate of Return (IRR) of 16%. Estimation of this figure was valuable in itself, as it offers a quantified estimate of the value of the railroad to society. But the real benefit of the cost-benefit analysis was in the process of identifying and quantifying the dynamics of the regional economy as it was observed, and as it would be without the railroad, and then



Figure 4: The quantity of bananas transported by the FCE now exceeds the coffee tonnage considerably

engaging key regional and national actors in discussing whether the model reflected reality. These discussions in themselves gave the FCE a much higher profile in regional political discourse. The studies coincided with the heightened vulnerability of the rail system after its closure for several months following the cyclones of early 2000. Policy makers were thus confronted with the immediate impact of the emergency closing as well as the REA's more analytic conclusions concerning the long term regional impacts should the rail line be allowed to die.

The picture of the likely evolution in the region without the railroad is one of considerable concern. One of the key findings from the quantitative and qualitative studies was the extent to which the households of the zone rely on the cash economy to obtain food. Cash is generated via an active commercial economy, which itself relies on the railroad. The region, for example, is a net importer of rice, which it brings in from the surplus producing areas of the high plateau. The research found a negative elasticity in the production of coffee with respect to the price of rice, which means that a given increase in the price of rice will result in a relatively larger reduction in the production of coffee. This reinforces the findings of the qualitative research team. Farmers report that if rice prices increase, they will significantly decrease or even cease coffee production in order to expand their production of rice for household consumption.

Given this context, it is clear that the train plays a critical role not only in exporting agricultural crops, but also in providing relatively inexpensive transport for rice from the Betsileo highlands to farmers in the Tanala Piedmont. Any disruption of this exchange economy will have important effects on the economy and environment of the zone now served by the train, as enumerated in the conclusions from the PAGE study which are summarized below.

In addition to these observations, we highlight three major conclusions:

The FCE is essential to the functioning of the commercial economy in the Tanala region

As noted above, the economy of this region is based on the sale of cash crops with revenue used to purchase essential household commodities including clothing, petrol, sugar, salt, and -- especially -- rice. Rice purchases are the backbone of household food security in this region. The FCE, by providing the least expensive transport into and out of the region, enables farmers to gain the maximum revenues from their production (transport costs are taken out of the price paid to producers), while offering rice at the lowest possible price (increases in rice transport prices are passed immediately on to the consumer).

The household economy at all levels of income depends on commercial agricultural production, which depends in turn on the train line. The 40% of the population who are relatively wealthier earn their revenues from the sale of agricultural products that are evacuated by train. The remaining 60%, who own little or no land², earn their livelihood primarily from selling their services to the landed classes. Their household revenues come from transporting bananas to the railhead, weeding and harvesting coffee, etc.

The majority of the population in this region can produce only a small fraction of their food supply and satisfy their remaining needs by purchasing rice and other staples. Most of the rice purchased by these populations is imported to the Tanala zone from the Betsileo rice producing regions in the highlands and is transported by train. If the train no longer operates, transport will be by road (a longer journey) or by porters, both of which are more expensive than rail transport. The study estimates that rice prices would increase as much as 25% if the train no longer operates.



Figure 5: Rice brought by train from the Betsileo highlands awaits delivery at the Tolongoina station

² Most of these families used to own land but lost it when they incurred significant debts. Indebtedness is usually caused by people needing to acquire a cow for funeral sacrifice or to pay off fines imposed by the community for one or another social infraction.

For the moment, the populations of the Tanala Piedmont do not generally suffer from food insecurity. However, if the train were to cease to operate, the majority of the population would face a simultaneous drop in revenues and increase in the price of all staple food and household commodities. This is likely to have an immediate and dramatic effect on food insecurity.

The Commercial Economy is Critical to Conserving the Forest Corridor

The commercial economy described above allows the population of this zone to buy a significant portion of their staple food supplies. If this economy no longer operates due to the lack of transport, the population will have to become self-sufficient in food production. Since many households do not currently own sufficient fields to be food self-sufficient, they will face substantial pressure to acquire additional land.

Those households that do own land now plant large areas in tree crops such as coffee and bananas. If there is no market for these crops, farmers will replace environmentally benign systems of permaculture on upland fields with annual food crops: namely rice and manioc. Both of these crops are notorious for depleting soil fertility, especially on the steep slopes that characterize much of this region. Cultivation of rice and manioc will soon render these fields unproductive, motivating the farmer to clear additional land.

Hence, both landless and landed populations will soon be seeking new and fertile lands on which to grow food crops. (For the landless the impact will be immediate; for the landed the effect will be in 5–10 years as existing fields become barren). only fertile land remaining in proximity to these villages is found in forests of the corridor. the face of such pressures, government project efforts to control expansion of slash and burn agriculture will be next to futile.



Figure 6: Rapid deforestation is likely to occur if there is no viable transport artery serving the eastern corridor region and the cash crop economy is stunted.

be
felt
The
the
In
or
the

With or without the train, demographic pressures will lead to a certain level of deforestation. However, the closing of the train line would unleash a considerably more aggressive use of the forest. The study estimates that 207,000 hectares of forest will fall before the axe in the next 20 years, as opposed to 159,000 hectares if the train continues to operate. The net difference will be due to people seeking to

assure their immediate food needs because they can no longer get their cash crops to market in the absence of rail transport.

The Destruction of the Forest Corridor Will Entail Serious Economic Consequences at the Local, Regional, and National Levels

The forest corridor plays a critical role in the hydrological balance of the region, serving as a massive sponge that collects water during periods of heavy rain and then releases it gradually over time. If *tavy* agriculture (complete clearing and planting on steep hillsides) disrupts this function, there will be serious reductions in agricultural productivity throughout the zone as well as increased costs for the maintenance and rehabilitation of infrastructures.

Deforestation has immediate impacts on soil fertility in the areas that are cleared of their protective canopy, as well as indirect impacts on agriculture in a much larger impact area. A patch of forest cleared for agriculture loses the value of the natural resources that could be harvested over time (e.g. wood for construction and fuel, medicinal plants, honey) as well as the value of the fertile soils that erode quickly once the trees are felled. Earlier studies estimated the loss of value incurred by cutting one hectare of tropical forest in Madagascar at \$84 per year: the difference between the value of the products that could be harvested from the intact forest and from the same parcel after its transformation by *tavy*.



Figure 7: The landslide damage to this road after cyclone Gloria in early 2000 offers vivid testimony to the costs of accelerated deforestation of steep slopes

Deforestation affects not only the land where the trees are felled, but also vast expanses of productive valleys and rice fields below. These areas will suffer from flooding during the rainy season (because water no longer infiltrates the denuded hillsides above) and water shortages during the dry season. The biggest casualty of this hydrological disruption is likely to be the inability of many farmers to produce a second irrigated rice harvest in the year, due to a lack of water. This outcome is by no means only theoretical. Villagers living in areas where there has been significant deforestation due to *tavy* in adjacent mountains have already experienced serious reductions in rice harvests and, in many cases, the complete failure of the second rice season.

Alongside falling agricultural productivity, the costs of infrastructure repair will increase. The region already incurs significant infrastructure damage many years since it bears the brunt of frequent cyclones. This problem will only worsen if the train ceases to operate. First of all, the already poor road infrastructure will have to transport many more heavy loads than it does now. But, perhaps even more serious, the accelerated destruction of the forest corridor will substantially increase the damage caused by excessive water run-off and erosion. We can expect a significant increase in the incidence of landslides and washouts affecting roads, bridges and other vital infrastructures.

The PAGE analysis highlights the critical need for an efficient and cost effective transport system serving this region of high agricultural productivity. The train currently provides only minimally acceptable levels of service but this level is sufficient to maintain at least basic food security for the vast majority of the population. Should this vital but fragile transport link be severed, the economy of the region will be thrown into turmoil. More than half the population will be unable to provide for their own food needs. This situation will compel households to pursue economic strategies that cause direct damage to the natural environment, with negative effects on not only existing populations, but also on generations to come.

Taking into consideration economic, social, and environmental impacts from the household level to the broader regional economy, the REA clearly demonstrates the benefits of maintaining transport services to this region ... and the significant costs of failing to do so. As such it contributes to a justification of the public expenditures that would be needed to implement the privatization of the line.

Key Findings from the Assessment of the Potential Financial Viability of the FCE Train Line

Having established the importance of maintaining the train transport system in the region, the next question concerns the feasibility of a private company's operating such a system on a profitable and sustainable basis. Analysis of this issue was conducted by the Fivoarana Consulting Firm.

The financial assessment of the FCE concluded that the rail line could generate an internal rate of return on the order of 15% under the appropriate conditions. These conditions include the following:

- A firm commitment by the government of Madagascar to retain a rail transport option for the Fianarantsoa Region;
- Privatization of the management structure of the FCE
- Restructuring of the debt of the company to convert short-term obligations to medium term
- A partnership approach among local, national and regional government

Calculation of the internal rate of return of the railroad investment is based on a number of assumptions:

- There is a resumption in the transport of fuel since fuel potentially accounts for as much as 2/3 of the rail line's total tonnage
- The company applies regular increases to fees charged for transport. Reducing the anticipated increase in transport fees (middle scenario) by only 1% point reduces the IRR by a full 3% points.

- The cost of repairing any significant cyclone damage to the tracks would be borne by the public holding company.

The amount of investment required to return the railroad system (tracks, bridges, etc.) to a viable operating state is in the order of US\$8–11 million. Although a significant amount of money, this investment would be considerably less than the US\$40 million estimated to return the Fianarantsoa–Manakara road system to a standard operating condition.

At present, discussions concerning the privatization of the railroad line continue between the regional and national Government officials, the World Bank, key projects (particularly the Landscape Development Initiatives Program of USAID) and the people of the region. Progress is slow but real and steady.

Lessons Learned and Links Between REA and Private Investment

The REA described above demonstrates the economic and environmental importance of the FCE to the region, while the internal financial study of the railroad showed the potential feasibility of the public/private management scenario that has been proposed, under conditions identified above.

A number of conclusions emerge from the process undertaken here.

Undertaking linked quantitative and qualitative studies as part of the REA proved to be an effective means to address and engage multiple audiences. In the many presentations of the REA between May–October 2000, the economists and others concerned with "hard" statistics were immediately engaged by the specific estimates, over a 20 year horizon, of agricultural production, rates of forest loss, effects of soil erosion and other variables.

The qualitative study, grounded in a series of RRA s conducted throughout the region, proved an critical and tangible counterbalance to the at-times overly abstract cost–benefit modeling exercise. On numerous occasions during presentation of the REA results, questions about the elements of the model , and why it was put together in a particular way, were answered by making reference to real families and communities that had participated in the RRA process. In addition, several key elements of the cost–benefit analysis that might otherwise have been overlooked were included as a result of analytic issues raised by the qualitative studies.

With hindsight, it has become increasingly clear that the combination of qualitative and quantitative findings, based on the integration of an abstract quantitative model with tangible field level observation, produced results that are significantly more convincing than what would have been obtained had only one type of research been carried out. The various conclusions are now being packaged and disseminated to best capture the interest of various stakeholders and actors in the privatization process, including national and regional policy makers, international donors, the press, and local communities

In any follow-on analyses, two broad areas will need to be addressed. First, the cost–benefit model's failure to enter into details of the hydrological system and the impact of forest cover loss on these watersheds implies an important missing piece of information. It is assumed that forest cover losses would be greater without the railroad, and that these losses would directly impact the productivity of agriculture. While at a local level, this certainly appears to be the case, the literature suggests (see, for

example, Chomitz and Kumari, 1996³) that hydrological impacts of primary forest loss vary considerably based on scale of the watershed, speed of secondary forest cover, type of rainfall, and other factors. Further study should certainly look at this issue but at this point it looks as though quantification of these issues will add further ammunition to arguments in favor of maintaining rail service.

Second, the study could have been strengthened by greater attention to the regional transport context. While the REA looked at this issue, it was not possible to undertake a sufficiently comprehensive costing out of the factors involved. In the end, the social/environmental return of 16% from the FCE privatization needs to be compared also to a complementary road transport investment. We have used the figure of US\$40 from a previous study, suggesting that the FCE infrastructure investments for privatization would cost far less the rehabilitation required of the alternative transport system. Again, it is likely that further studies quantifying the full extent of investments needed to replace the transport services lost if the FCE goes out of service will strengthen arguments for investing in the rail network.

Until now, the GoM has played an active role in road maintenance but has largely neglected the rail system. This study has made the case that the railroad transport system is not only an important means of securing the livelihood of the inhabitants of the region -- it is also a means of slowing the loss of critical environmental resources. As such, the REA has provided vital information for policy makers who are involved in critical decisions regarding the expenditure of scarce public funds in general and the privatization of the FCE rail line in particular.

³ Kenneth M. Chomitz and Kanta Kumari, "The Domestic Benefits of Tropical Forests: A Critical Review Emphasizing Hydrological Functions", Policy Research Working Paper 1601, The World Bank, Policy Research Department, Environment, Infrastructure, and Agriculture Division, May, 1996.